BlackWing - Serial Automation Protocol Document

R599728

This document describes the BlackWing (Ref. No.R9010084 (ST), R9010085 (LT)) operation when it is connected to an automation system controller through the serial port.

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1.0 OUTLINE

This document describes the protocol used for the RS-232 data communication. RS-232 is the most known serial port used in transmitting the data in communication and interface. This is the most effective method in which only three wire links are used. The three links provides 'transmit', 'receive' and common ground. An automation control interface can easily be programmed to manage any compatible unit.

2.0 COMMUNICATION FORMAT

Transfer Rate	: 9600, 19200(default) bps
Data Length	: 8 bits
Parity Bit	: None
Stop Bit	: 1 bit
Flow Control	: None

3.0 DATA FORMAT

3.1 Command Data Format (External Control to Projector)

Header	ID	SP	Command	SP	Parameter	SP	Parameter	SP	...	CR

Header	: Indicates the beginning of data and data type. '!'(21H) : Command for the Projector '?'(3FH) : Query to the Projector (Request for data)
ID	: Identification number of Projector
SP	: Indicates the separation between ID and command, command and parameter, parameter and parameter (20H)
CR	: Indicates the end of data (0DH)

3.2 Tally (Response) Data Format (Projector to External Control)

3.2.1 Tally (Response) Data when Terminated Normally

Header	ID	SP	Normal Termination Status	SP	Parameter	SP	Parameter	...	CR

Header	: Indicates the beginning of tally (response) data '@'(40H)
ID	: Identification number of the Projector
SP	: Indicates the separation between ID and status, status and parameter, parameter and parameter (20H)
Normal Termination Status	: '0'(30H)
CR	: Indicates the end of data (0DH)

* Parameter is sent when tally (response) data is issued in response to a query (request for data.) There is no parameter for tally (response) data in response to a command.

3.2.2 Tally Data when Error Occurs

Header	ID	SP	Error Status	CR

Header : Indicates the beginning of the tally (response) data
'@'(40H)

ID : Identification number of Projector

SP : Indicates the separation between ID and Status (20H)

Error Status : 'A00' (41H 30H 30H)
'A01' (41H 30H 31H)
'A02' (41H 30H 32H)
'A03' (41H 30H 33H)
'A04' (41H 30H 34H)
'A05' (41H 30H 35H)
'A0A' (41H 30H 41H)
'A0B' (41H 30H 42H)

CR : Indicates the end of the data (0DH)

For details on error status, refer to 8.0 Tally (Response) Data.

3.3 Internal Error Data Format (Projector to External Control)

Header	ID	SP	Internal Error Status	SP	Parameter	SP	Parameter	SP	...	CR

Header : Indicates the beginning of the internal error data
'&'(26H)

ID : Identification of Projector

SP : Indicates the separation between ID and status, status and parameter, parameter and parameter (20H)

Internal Error Status : 'E01' (45H 30H 31H)
'E06' (45H 30H 36H)
'E07' (45H 30H 37H)
'E08' (45H 30H 38H)
'E09' (45H 30H 39H
'E15' (45H 31H 35H)

CR : Indicates the end of the data (0DH)

For details on internal error status, refer to 9. Internal Errors.

4.0 HEADER

Indicates the beginning and type of communication data.

4.1 External Control to Projector

Character	HEX	Definition
'!'	21H	Command to the Projector
'?'	3FH	Query (request for information) to the Projector

4.2 Projector to External Control

Character	HEX	Definition
'@'	40H	Tally (Response) data
'&'	26H	Internal error data

5.0 IDENTIFICATION (ID)

Numeric characters are used to identify an individual Projector when two or more Projector units are connected to a single control machine.

Setting separate identification numbers for each Projector allows independent control of each Projector unit.

Assignable ID numbers

'0'(30H)	: '8' (38H)
'1'(31H)	: '9' (39H)
'2'(32H)	: 'A' (41H)
'3'(33H)	: 'B' (42H)
'4'(34H	: 'C' (43H)
'5'(35H)	: 'D' (44H)
'6'(36H)	: 'E' (45H)
'7'(37H)	: 'F' (46H)

Default Factory set ID is '1' (31H).

ID number '0' (30H) should be used when assigning all connected Projector units for batch operations. This means that when assigning independent ID numbers to multiple units, 15 of the 16 assignable numbers (from '1' through 'F') can actually be used for registration. Please note that tally (response) data is not returned from the projector when the global ID assignment function (0) is used.

6.0 CARRIAGE RETURN (CR)

The carriage return (CR) is one of the control characters in ASCII code that commands a printer or other sort of display to move the position of the cursor to the first position on the same line. It was mostly used along with line feed, a move to the next line, while carriage return precedes line feed to indicate a new line.

The CR symbol is used in the RS-232 protocol to indicates the end of each set of data by sending the 0DH value

7.0 PARAMETERS

There are three types of parameters:

1. Indicates the numeric value.

2. Indicates the ON/OFF status.

3. Special parameter.

7.1 Numeric Value Parameter

Signed 2-byte hexadecimal code represented by 4 (byte) characters.
Assignable range is between ‘8000’ and ‘7FFF’.

Ex-1) : The parameter indicating ‘20’ (decimal):
Since ‘20’ (decimal) is represented as ‘0014’ in signed 2-byte hexadecimal, its parameter is: ‘0014’(30H 30H 31H 34H)

Ex-2) : The parameter to indicate ‘-2’ (decimal):
Since ‘-2’ (decimal) is represented as ‘FFFE’ in signed 2-byte hexadecimal, its parameter is: ‘FFFE’(46H 46H 46H 45H)

7.2 ON/OFF Status Parameter

Indicates the ON/OFF status of items such as POWER or HIDE.

Character	HEX	Definition
‘0’	30H	OFF
‘1’	31H	ON

7.3 Special Parameters

Parameters other than those described in 7.1 to 7.2.

7.3.1 Back Color Parameter

Character	HEX	Definition
‘0’	30H	Blue
‘1’	31H	Black

7.3.2 Color Temperature Parameter

Character	HEX	Definition
‘0’	30H	D65
‘2’	32H	USER 1
‘3’	33H	USER 2

7.3.3 Menu Display Auto OFF Parameter

Character	HEX	Definition
‘0’	30H	15 sec
‘1’	31H	ON

7.3.4 Zoom/Focus Parameter

Character	HEX	Definition
‘0’	30H	STOP
‘1’	31H	START

7.3.5 Transfer Rate Parameter

Character	HEX	Definition
‘0’	30H	9600 bps
‘1’	31H	19200 bps

7.3.6 ID Parameter

Character	HEX	Definition
‘0’	30H	Global command for all attached projectors
‘1’	31H	ID 1
‘2’	32H	ID 2
‘3’	33H	ID 3
‘4’	34H	ID 4
‘5’	35H	ID 5

‘6’	36H	ID 6
‘7’	37H	ID 7
‘8’	38H	ID 8
‘9’	39H	ID 9
‘A’	41H	ID 10
‘B’	42H	ID 11
‘C’	43H	ID 12
‘D’	44H	ID 13
‘E’	45H	ID 14
‘F’	46H	ID 15

7.3.7 Gamma Table Parameter

Character	HEX	Definition
‘0’	30H	NORMAL
‘1’	31H	A
‘2’	32H	B
‘3’	33H	CUSTOM

7.3.8 Mask Parameter

Character	HEX	Definition
‘0’	30H	0 %
‘1’	31H	2.5 %
‘2’	32H	5 %

7.3.9 Test Pattern Parameter

Character	HEX	Definition
‘0’	30H	OFF
‘1’	31H	Color Bar
‘2’	32H	Ramp (Black and White)
‘3’	33H	Ramp (only red)
‘4’	34H	Ramp (only green)
‘5’	35H	Ramp (only blue)
‘6’	36H	Stair Case (black and white)
‘7’	37H	Stair Case (only red)
‘8’	38H	Stair Case (only green)
‘9’	39H	Stair Case (only blue)
‘A’	41H	Cross Hatch (only green)

7.3.10 Zoom/Focus Lock Parameter

Character	HEX	Definition
‘0’	30H	Unlock
‘1’	31H	Lock

7.3.11 Projector Operation Mode Parameter

Character	HEX	Definition
'0000'	30H 30H 30H 30H	Standby Mode
'0001'	30H 30H 30H 31H	Power ON Mode
'0002'	30H 30H 30H 32H	Cool-Down Mode
'0003'	30H 30H 30H 33H	Reserved
'0004'	30H 30H 30H 34H	Emergency Mode

7.3.12 Horizontal Pixel Adjust Parameter

Character	HEX	Definition
'1'	31H	Pixel moves left by three pixels
'2'	32H	Pixel moves left by two pixels
'3'	33H	Pixel moves left by one pixel
'4'	34H	Pixel moves to standard position
'5'	35H	Pixel moves right by one pixel
'6'	36H	Pixel moves right by two pixels
'7'	37H	Pixel moves right by three pixels

7.3.13 Vertical Pixel Adjust Parameter

Character	HEX	Definition
'1'	31H	Pixel moves below by three pixels
'2'	32H	Pixel moves below by two pixels
'3'	33H	Pixel moves below by one pixel
'4'	34H	Pixel moves to standard position
'5'	35H	Pixel moves above by one pixel
'6'	36H	Pixel moves above by two pixels
'7'	37H	Pixel moves above by three pixels

8.0 TALLY(RESPONSE) DATA

The Projector will only accept and process data when the ID number included with the data coincides with the ID-number registered to the Projector itself. (Except when ID = ‘0’) If the received ID-number matches the Projector’s ID, it will return a response to the query from the external control unit. This response data is called "Tally (Response) Data". (However, when ID = ‘0’, tally (response) data is not replied.)

The Tally (Response) Data is normally returned within 3 seconds after the data is received.There are some exceptions, however (e.g. POWER command)

After transmitting data, the external control unit cannot transmit subsequent data until the Tally (Response) Data is received. However, if Tally (Response) Data is not returned within 3 seconds after transmitting the data (there are some exceptions such as the POWER command), data transmission can be retried.

8.1 Tally (Response) Data Status

8.1.1 Normal Termination Status

Character	HEX	Definition
‘0’	30H	Command received and processing terminated

8.1.2 Status when Error Occurs (Error Status)

Character	HEX	Definition
‘A00’	41H 30H 30H	Command not supported
‘A01’	41H 30H 31H	Invalid parameter
‘A02’	41H 30H 32H	Parameter value exceeds operation range
‘A03’	41H 30H 33H	Unclassified error
‘A04’	41H 30H 34H	Unacceptable command in current mode or Unacceptable command with current setting
‘A05’	41H 30H 35H	Command cannot be accepted if no signal.
‘A0A’	41H 30H 41H	Time-out occurred during the communication
‘A0B’	41H 30H 42H	Error occurred during the communication

8.2 Tally (Response) Data Parameter

The Tally (Response) Data Parameter is returned when the Tally (Response) Data is issued in response to a query (request for data). No parameter is returned when Tally (Response) Data issued in response to a command or when an error occurs.

9.0 INTERNAL ERRORS

Error data is returned to the external control unit when an error has occurred.

9.1 Internal Error Data Status (Internal Error Status)

Character	HEX	Definition
‘E01’	45H 30H 31H	Lamp did not light
‘E02’	45H 30H 32H	Lamp life time exceeded 2000 hours.
‘E06’	45H 30H 36H	Lamp suddenly goes out (Lamp Shut Down) during power ON mode
‘E07’	45H 30H 37H	Fan is locked
‘E08’	45H 30H 38H	Internal temperature is too high.
‘E09’	45H 30H 39H	Temperature around air intake is going up abnormally.
‘E15’	45H 31H 35H	Lamp cover is off.

9.2 Internal Error Data Parameters

There are two parameters for Internal Error Data.

Header	ID	SP	Internal Error Status	SP	**Parameter 1**	SP	**Parameter 2**	CR

Each parameter shows the slave address (Parameter 1) and Sub-Address (Parameter 2) when an IIC ACK error (Error status: ‘E03’) occurs. The parameter type is "numeric value".

Two parameters are also returned when an internal errors other than IIC ACK errors occur. In this case, however, the parameter’s numeric value has no meaning.

Ex) Internal error data when IIC ACK error occurs with Slave address ‘A0H’ and Sub-address of ‘1F20H’:

‘&’	ID	SP	‘E03’	SP	‘00A0’	SP	‘1F20’	CR

9.3 Internal Error Data Reply Timing

When returning data, the Projector checks for internal error data. If such data exists, the internal error data is returned before the tally (response) data is transmitted. That is, if an internal error occurs, the Projector retains the internal error data, returning it in order of precedence a request for tally (response) data is received. Once transmitted, internal error data is deleted from the Projector.

10.0 PROJECTOR OPERATION MODES

This section describes the BlackWing's four basic operation modes.

10.1 Standby Mode

The Projector enters this mode when it is plugged into an AC outlet. The lamp does not light and the fans do not operate.

10.2 Power ON Mode

This mode is engaged when the POWER ON command is received and processed normally in the Standby mode. The lamp is lighted and the fans start rotating. Images can be projected in this mode.

10.3 Cool-Down Mode

This mode is engaged when the POWER OFF command is received and processed normally in the Power ON mode.

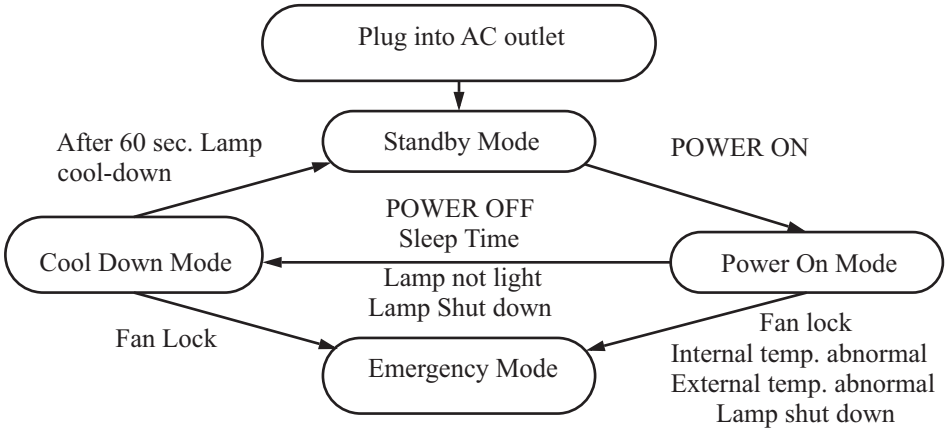
1.The lamp goes out and the fans are rotated continuously to cool down the lamp.

2. To avoid the lamp is lighted again in short time, the POWER ON command is not accepted during this mode.

For the Cineversum BlackWing Series, the Cool-Down Mode time is approximate 60 seconds. The lamp goes out and the fans are rotated continuously during this mode to cool down the lamp. After the mentioned time lapse, the unit automatically enters the Standby mode.

10.4 Emergency Mode

This mode is engaged when the projector malfunctions or is improperly operated. The lamp and the fans are shut down and the AC outlet is unplugged. Non-operation status continues until the reset function is activated.



The acceptance condition of a command differs depending on the operation mode.

11.0 SOURCE

The input signals to projectors can be only Video Sources of three kinds as follows.

- 1080p60
- 1080p50
- 1080p48

11.1 Sources and Source Numbers

Character	Source Number (CHAR)	Source Number (HEX)
1080p60	‘10’	31H 30H
1080p50	‘11’	31H 31H
1080p48	‘12’	31H 32H
Out Of Range	‘FE’	46H 45H
No Signal	‘FF’	46H 46H

12.0 COMMANDS

This section describes the commands that can be used with the Projector.

- In the Communication Examples, the ID number registered on the Projector is represented as '1' (31H). This is the default setting.
- "CTLR" refers to transmissions from the external control unit and "DLA" refers to transmissions (Tally (Response) Data) from the Projector.
- "Reply Time" refers to the maximum time required between command reception and return of Tally (Response) Data. In other words, it refers to the maximum time that the external control unit must wait for the Tally (Response) Data.
- For details on the different parameters, refer to 7.0 Parameters.
- Acceptance or non-acceptance of a command in each operation mode is indicated by "O" (accept) or "X" (does not accept).

12.1 Hide : 'U00'(55H 30H 30H)

Definition : Controls video signal muting
Command : 'U00'(55H 30H 30H)
Parameter type : ON/OFF
Reply time : 3 seconds
Conditions : This command is unavailable for about 5 seconds after turn on. (At this time, error does not occur.)

12.1.1 Operation mode

Standby Mode	Power ON mode	Cool-down mode	Emergency mode
X	O	X	X

12.1.2 Communication Examples

- To turn HIDE ON
  CTLR '!' '1' SP 'U00' SP '1' CR
  DLA '@' '1' SP '0' CR
- When requesting current HIDE status (if HIDE status is ON)
  CTLR '?' '1' SP 'U00' CR
  DLA '@' '1' SP '0' SP '1' CR
- When trying to change HIDE status in emergency mode (turn ON)
  CTLR '!' '1' SP 'U00' SP '1' CR
  DLA '@' '1' SP 'A04' CR

12.2 Back Color : 'U01'(55H 30H 31H)

Definition : Controls back color
Command : 'U01'(55H 30H 31H)
Parameter type : Special parameter(Refer to 7.3.1 Back Color Parameter.)
Reply time : 3seconds
Conditions :

Operation mode

Standby Mode	Power ON mode	Cool-down mode	Emergency mode
X	O	X	X

Communication Examples

- When specifying the back color to “black”

  CTLR ‘!’ ‘1’ SP ‘U01’ SP ‘1’ CR

  DLA ‘@’ ‘1’ SP ‘0’ CR

- When requesting the current back color data (if the back color is set to “blue”)

  CTLR ‘?’ ‘1’ SP ‘U01’ CR

  DLA ‘@’ ‘1’ SP ‘0’ SP ‘0’ CR

12.3 Color Temperature Table : ‘U0B’(55H 30H 42H)

Definition : Sets the color temperature table

Command : ’U0B’(55H 30H 42H)

Parameter type : Special parameter (Refer to 7.3.2 Color Temperature Parameter.)

Reply time : 3seconds

Conditions :

Operation mode

Standby Mode	Power ON mode	Cool-down mode	Emergency mode
X	O	X	X

Communication Examples

- When specifying "USER1" as the color temperature

  CTLR ‘!’ ‘1’ SP ‘U0B’ SP ‘2’ CR

  DLA ‘@’ ‘1’ SP ‘0’ CR

- When requesting current color temperature data (if color temperature is set to “D65”)

  CTLR ‘?’ ‘1’ SP ‘U0B’ CR

  DLA ‘@’ ‘1’ SP ‘0’ SP ‘0’ CR

12.4 Color Temperature (Red) : ‘U0C’(55H 30H 43H)

Definition : Adjusts the color temperature (red)

Command : ’U0C’(55H 30H 43H)

Parameter type : Numeric

Reply time : 3seconds

Conditions :

Operation mode

Standby Mode	Power ON mode	Cool-down mode	Emergency mode
X	O	X	X

Communication Examples

- When specifying "-2" (decimal) as the color temperature (RED) adjust level

  CTLR ‘!’ ‘1’ SP ‘U0C’ SP ‘FFFE’ CR

  DLA ‘@’ ‘1’ SP ‘0’ CR

- When requesting current color temperature (red) adjust level data (if color temperature (red) adjust level is set to "-128" (decimal))

  CTLR ‘?’ ‘1’ SP ‘U0C’ CR

  DLA ‘@’ ‘1’ SP ‘0’ SP ‘FF80’ CR

12.5 Color Temperature (Green) : ‘U0D’(55H 30H 44H)

Definition : Adjusts the color temperature (green)

Command : ’U0D’(55H 30H 44H)

Parameter type : Numeric

Reply time : 3seconds

Conditions :

Operation mode

Standby Mode	Power ON mode	Cool-down mode	Emergency mode
X	O	X	X

Communication Examples

- When specifying "-2" (decimal) as the color temperature (green) adjust level

  CTLR ‘!’ ‘1’ SP ‘U0D’ SP ‘FFFE’ CR

  DLA ‘@’ ‘1’ SP ‘0’ CR

- When requesting current color temperature (green) adjust level data (if color temperature (green) adjust level is set to "-128" (decimal))

  CTLR ‘?’ ‘1’ SP ‘U0D’ CR

  DLA ‘@’ ‘1’ SP ‘0’ SP ‘FF80’ CR

12.6 Color Temperature (Blue) : ‘U0E’(55H 30H 45H)

Definition : Adjusts the color temperature (blue)

Command : ’U0E’(55H 30H 45H)

Parameter type : Numeric

Reply time : 3seconds

Conditions :

Operation mode

Standby Mode	Power ON mode	Cool-down mode	Emergency mode
X	O	X	X

Communication Examples

- When specifying "-2" (decimal) as the color temperature (blue) adjust level

  CTLR ‘!’ 1’ SP ‘U0E’ SP ‘FFFE’ CR

  DLA ‘@’ ‘1’ SP ‘0’ CR

- When requesting current color temperature (blue) adjust level data (if color temperature (blue) adjust level is set to "-128" (decimal))

  CTLR ‘?’ ‘1’ SP ‘U0E’ CR

  DLA ‘@’ ‘1’ SP ‘0’ SP ‘FF80’ CR

12.7 POWER : ‘U0F’(55H 30H 46H)

Definition : Controls the power

Command : ’U0F’(55H 30H 46H)

Parameter type : ON/OFF

Reply time : POWER ON transmission 120 seconds (*1)
POWER OFF transmission 3 seconds (*2)

Conditions : No query

Operation mode

Standby Mode	Power ON mode	Cool-down mode	Emergency mode
O	O	X	X

Communication Examples

- When turning the Projector’s power ON

  CTLR ‘!’ ‘1’ SP ‘U0F’ SP ‘1’ CR

  DLA ‘@’ ‘1’ SP ‘0’ CR

*1 - When the POWER ON command is received, the projector returns the Tally (Response) Data after completing all the POWER ON processing operations (lighting lamp, rotating fans, transmitting data, etc.). In most cases, the Tally (Response) Data should be returned within 35 to 40 seconds.
If it takes more time to light up or re-try is done due to internal error , these operations takes maximum around 120 seconds. (The Tally Data is returned within 120 seconds.).

*2 - When the POWER OFF command is received during Power-ON mode, the Projector enters the cool-down mode (for about 60 seconds) and continue cooling . After cool-down mode is completed, the Projector automatically enters the stand-by mode. (For operation modes, refer to 10. Projector Operation Modes.)
POWER ON command cannot be accepted in the Cool-Down mode. If POWER ON is requested after POWER OFF command is sent, firstly the current operation mode should be asked and then if Standby Mode is confirmed, POWER ON command should be sent. (For the command to request the current operation mode, refer to 12.31 Operation Mode Query.).

12.8 MENU Auto OFF : ‘U10’(55H 31H 30H)

Definition : Controls the display menu auto-off function
Command : ’U10’(55H 31H 30H)
Parameter type : Special parameter (Refer to 7.3.3 Menu Display Auto OFF Parameter.)
Reply time : 3seconds
Conditions :

Operation mode

Standby Mode	Power ON mode	Cool-down mode	Emergency mode
X	O	X	X

Communication Examples

- When setting the menu display auto off to 15 sec
  CTLR ‘!’ ‘1’ SP ‘U10’ SP ‘0’ CR
  DLA ‘@’ ‘1’ SP ‘0’ CR
- When requesting the current menu display auto-off setting (if the menu display auto off is set to ON)
  CTLR ‘?’ ‘1’ SP ‘U10’ CR
  DLA ‘@’ ‘1’ SP ‘0’ SP ‘1’ CR

12.9 Sleep Time : ‘U12’(55H 31H 32H)

Definition : Sets the sleep time
Command : ’U12’(55H 31H 32H)
Parameter type : (*)
Reply time : 3seconds
Conditions :

Operation mode

Standby Mode	Power ON mode	Cool-down mode	Emergency mode
X	O	X	X

The "Sleep time" function automatically turns off the projector power if the no-signal status continues for a specified time.

Available parameters :
Sleep time can be set to any of the following: 15 min., 30 min., 60 min., and 0 min.

When the above times are represented as numerical parameters in minutes:

Delay	Character	HEX
15 min	‘000F’	30H 30H 30H 46H
30 min	‘001E’	30H 30H 31H 45H
60 min	‘003C’	30H 30H 33H 43H
0 min	‘0000’	30H 30H 30H 30H

The sleep time function is disabled when the time is set to “0 min”.

Tally (Response) data format to current sleep time query

‘@’	‘1’	SP	Normal Termination Status	SP	Parameter 1	SP	Parameter 2	CR

Parameter 1 : Indicates the sleep time specified
(Refer to "Available parameters")
Parameter 2 : Indicates the remaining sleep time.
Parameter type is numeric.

Communication Examples

- When specifying "30 min." as the sleep time
  CTLR ‘!’ ‘1’ SP ‘U12’ SP ‘001E’ CR
  DLA ‘@’ ‘1’ SP ‘0’ CR
- When requesting the current sleep time setting (if the sleep time is set to "15 min." and the remaining time is 3 min.)
  CTLR ‘?’ ‘1’ SP ‘U12’ CR
  DLA ‘@’‘1’ SP ‘0’ SP ‘000F’ SP ‘0003’ CR

12.10 Zoom W : ‘U13’(55H 31H 33H)

Definition : Enlarges the screen size
Command : ’U13’(55H 31H 33H)
Parameter type : Special parameter (Refer to 7.3.4 ZOOM/FOCUS Parameter.)
Reply time : 3seconds
Conditions : No query
Notes : It becomes an error when the "Zoom/Focus Lock" parameter is set to Lock. Also it becomes an error when HIDE is ON.

Operation mode

Standby Mode	Power ON mode	Cool-down mode	Emergency mode
X	O	X	X

Communication Examples

CTLR	'!'	'1'	SP	'U13'	SP	'1'	CR				
DLA							'@'	'1'	SP	'0'	CR
CTLR	'!'	'1'	SP	'U13'	SP	'0'	CR				
DLA							'@'	'1'	SP	'0'	CR

Be sure to transmit the STOP command after transmitting the START command.

12.11 Zoom T : 'U14'(55H 31H 34H)

Definition : Reduces the screen size

Command : 'U14'(55H 31H 34H)

Parameter type : Special parameter (Refer to 7.3.4 ZOOM/FOCUS Parameter.)

Reply time : 3seconds

Conditions : No query

Notes : It becomes an error when the "Zoom/Focus Lock" parameter is set to Lock. Also it becomes an error when HIDE is ON.

Operation mode

Standby Mode	Power ON mode	Cool-down mode	Emergency mode
X	O	X	X

Communication Examples

CTLR	'!'	'1'	SP	'U14'	SP	'1'	CR				
DLA							'@'	'1'	SP	'0'	CR
CTLR	'!'	'1'	SP	'U14'	SP	'0'	CR				
DLA							'@'	'1'	SP	'0'	CR

Be sure to transmit the STOP command after transmitting the START command.

12.12 Focus + : 'U15'(55H 31H 35H)

Definition : Moves the focal point forward

Command : 'U15'(55H 31H 35H)

Parameter type : Special parameter (Refer to 7.3.4 ZOOM/FOCUS Parameter.)

Reply time : 3seconds

Conditions : No query

Notes : It becomes an error when the "Zoom/Focus Lock" parameter is set to Lock. Also it becomes an error when HIDE is ON.

Operation mode

Standby Mode	Power ON mode	Cool-down mode	Emergency mode
X	O	X	X

Communication Examples

CTLR	'!'	'1'	SP	'U15'	SP	'1'	CR				
DLA							'@'	'1'	SP	'0'	CR
CTLR	'!'	'1'	SP	'U15'	SP	'0'	CR				
DLA							'@'	'1'	SP	'0'	CR

Be sure to transmit the STOP command after transmitting the START command.

12.13 Focus - : 'U16'(55H 31H 36H)

Definition : Moves the focal point back
Command : 'U16'(55H 31H 36H)
Parameter type : Special parameter (Refer to 7.3.4 ZOOM/FOCUS Parameter.)
Reply time : 3seconds
Conditions : No query
Notes : It becomes an error when the "Zoom/Focus Lock" parameter is set to Lock. Also it becomes an error when HIDE is ON.

Operation mode

Standby Mode	Power ON mode	Cool-down mode	Emergency mode
X	O	X	X

Communication Examples

CTLR	'!'	'1'	SP	'U16'	SP	'1'	CR				
DLA							'@'	'1'	SP	'0'	CR
CTLR	'!'	'1'	SP	'U16'	SP	'0'	CR				
DLA							'@'	'1'	SP	'0'	CR

Be sure to transmit the STOP command after transmitting the START command.

12.14 Right/Left Reverse : 'U17'(55H 31H 37H)

Definition : Reverses the image horizontally
Command : 'U17'(55H 31H 37H)
Parameter type : ON/OFF
Reply time : 3seconds
Conditions :

Operation mode

Standby Mode	Power ON mode	Cool-down mode	Emergency mode
X	O	X	X

Communication Examples

- When reversing the image horizontally (Right /Left reverse)

  CTLR '!' '1' SP 'U17' SP '1' CR

  DLA '@' '1' SP '0' CR

- When requesting the current R/L reverse setting (if the image is not reversed horizontally)

  CTLR '?' '1' SP 'U17' CR

  DLA '@' '1' SP '0' SP '0' CR

12.15 Top/Bottom Invert : 'U18'(55H 31H 38H)

Definition : Inverts the image vertically
Command : 'U18'(55H 31H 38H)
Parameter type : ON/OFF
Reply time : 3seconds
Conditions :

Operation mode

Standby Mode	Power ON mode	Cool-down mode	Emergency mode
X	O	X	X

Communication Examples

- When inverting the image vertically (Top/Bottom invert)

  CTLR '!' '1' SP 'U18' SP '1' CR

  DLA '@' '1' SP '0' CR

- When requesting the current Top/Bottom invert setting (if the image is not inverted vertically)

  CTLR '?' '1' SP 'U18' CR

  DLA '@' '1' SP '0' SP '0' CR

12.16 Transfer Rate : 'U1B'(55H 31H 42H)

Definition : Controls the transfer rate for RS-232C
Command : 'U1B'(55H 31H 42H)
Parameter type : Special parameter (Refer to 7.3.5 Transfer Rate Parameter.)
Reply time : 3seconds
Conditions :

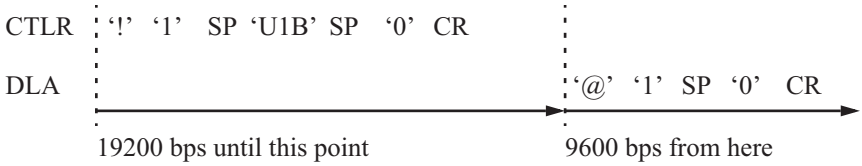
Operation mode

Standby Mode	Power ON mode	Cool-down mode	Emergency mode
X	O	X	X

* After this command has been received and processed correctly, the Tally (Response) Data is returned at the new transfer rate.

Communication Examples

When changing the transfer rate to "9600 bps" from the current setting of "19200 bps"



The default transfer rate setting is "19200bps".

12.17 Lamp Time : 'U1C'(55H 31H 43H)

Definition : Reset/check the lamp operation
Command : 'U1C'(55H 31H 43H)
Parameter type : (*)
Reply time : 3seconds
Conditions :

Operation mode

- When resetting

Standby Mode	Power ON mode	Cool-down mode	Emergency mode
O	X	X	X

- When requesting current time

Standby Mode	Power ON mode	Cool-down mode	Emergency mode
O	O	O	O

Data Format

- Reset data format

'@'	'1'	SP	'U1C'	SP	Reset Parameter	CR

- Reset parameter

Character	HEX
'[()]'	5BH 28H 29H 5DH

Never issue the Reset command unless the lamp has been replaced with a new one.

- Tally (Response) data format when requesting current time

'@'	'1'	SP	Normal Termination Status	SP	Para. 1	SP	Para. 2	CR

Parameter 1:
The Projector has an incremental counter which counts Lamp Operation Time at 1 time in every 4 minutes. Parameter 1 shows this counter value. The parameter type is "numeric".
Actual lamp operating time is obtained by converting the Parameter 1 value into signed 2-byte binary hexadecimal and dividing it by 15.

Parameter 2:
Parameter 2 shows whether the lamp replacement time is close or not, based on the following
calculation:
(Lamp service life - 100 hours) =< Lamp operating time < Lamp service life

	Character	HEX
Normal lamp life	'0'	30H
Lamp replacement time close	'1'	31H
Lamp life exceeded	'2'	32H

Communication Examples

- When requesting the current lamp operating time (if the lamp operating time is 150 hours)

  CTLR '?' '1' SP 'U1C' CR

  DLA '@' '1' SP '0' SP '08CA' SP '0' CR

12.18 ID : 'U1D'(55H 31H 44H)

Definition : Sets the ID for the Projector
Command : 'U1D'(55H 31H 44H)
Parameter type : Special parameter (Refer to 7.3.6 ID Parameter.)
Reply time : 3seconds
Conditions :

Operation mode

Standby Mode	Power ON mode	Cool-down mode	Emergency mode
O	O	O	O

When this command is received and processed correctly, the Tally (Response) Data is returned with the changed ID number.

Communication Examples

- When changing the ID to ‘7’ from the current setting of ‘1’

  CTLR ‘!’ ‘1’ SP ‘U1D’ SP ‘7’ CR

  DLA ‘@’ ‘7’ SP ‘0’ CR

Tally (Response) data is returned as ID no. 7.

- When requesting the ID setting (if the ID is set to "3”)

  CTLR ‘?’ ‘3’ SP ‘U1D’ CR

  DLA ‘@’ ‘3’ SP ‘0’ SP ‘3’ CR

12.19 Gamma Table : ‘U73’(55H 37H 33H)

Definition : Sets the gamma table
Command : ’U73’(55H 37H 33H)
Parameter type : Special parameter (Refer to 7.3.7 Gamma Table Parameter.)
Reply time : 3seconds
Conditions :

Operation mode

Standby Mode	Power ON mode	Cool-down mode	Emergency mode
X	O	X	X

Communication Examples

- When specifying "A" as the gamma table

  CTLR ‘!’ ‘1’ SP ‘U73’ SP ‘1’ CR

  DLA ‘@’ ‘1’ SP ‘0’ CR

- When requesting current gamma table data (if gamma table is set to "NORMAL”)

  CTLR ‘?’ ‘1’ SP ‘U73’ CR

  DLA ‘@’ ‘1’ SP ‘0’ SP ‘0’ CR

12.20 Mask : ‘UA0’(55H 41H 30H)

Definition : Sets the mask
Command : ’UA0’(55H 41H 30H)
Parameter type : Special parameter (Refer to 7.3.8 Mask Parameter.)
Reply time : 3seconds
Conditions :

Operation mode

Standby Mode	Power ON mode	Cool-down mode	Emergency mode
X	O	X	X

Communication Examples

- When specifying "2.5%" as the mask
  CTLR ‘!’ ‘1’ SP ‘UA0’ SP ‘1’ CR
  DLA ‘@’ ‘1’ SP ‘0’ CR
- When requesting current mask data (if mask is set to "0%”)
  CTLR ‘?’ ‘1’ SP ‘UA0’ CR
  DLA ‘@’ ‘1’ SP ‘0’ SP ‘0’ CR

12.21 Test Pattern : ‘UA1’(55H 41H 31H)

Definition : Sets the test pattern
Command : ’UA1’(55H 41H 31H)
Parameter type : Special parameter (Refer to 7.3.9 Test Pattern Parameter.)
Reply time : 3seconds
Conditions :

Operation mode

Standby Mode	Power ON mode	Cool-down mode	Emergency mode
X	O	X	X

Communication Examples

- When specifying "Cross Hatch (only G)" as the test pattern
  CTLR ‘!’ ‘1’ SP ‘UA1’ SP ‘A’ CR
  DLA ‘@’ ‘1’ SP ‘0’ CR
- When requesting current test pattern data (if Test Pattern is set to "OFF”)
  CTLR ‘?’ ‘1’ SP ‘UA1’ CR
  DLA ‘@’ ‘1’ SP ‘0’ SP ‘0’ CR

12.22 Picture Shift : ‘UA2’(55H 41H 32H)

Definition : Sets the vertical picture shift
Command : ’UA2’(55H 41H 32H)
Parameter type : Numeric
Reply time : 3seconds
Conditions :

Operation mode

Standby Mode	Power ON mode	Cool-down mode	Emergency mode
X	O	X	X

Communication Examples

- When specifying 1 as the picture shift

  CTLR ‘!’ ‘1’ SP ‘UA2’ SP ‘0001’ CR

  DLA ‘@’ ‘1’ SP ‘0’ CR

- When requesting current picture shift data (if picture shift is set to -1)

  CTLR ‘?’ ‘1’ SP ‘UA2’ CR

  DLA ‘@’ ‘1’ SP ‘0’ SP ‘FFFF’ CR

12.23 Zoom/Focus Lock : ‘UA9’(55H 41H 39H)

Definition : Sets the Zoom/Focus function to Lock or Unlock.
Command : ’UA9’(55H 41H 39H)
Parameter type : Special parameter (Refer to 7.3.10 Zoom/Focus Lock Parameter.)
Reply time : 3seconds
Conditions :

Operation mode

Standby Mode	Power ON mode	Cool-down mode	Emergency mode
X	O	X	X

Communication Examples

- When specifying "Unlock" as the Zoom/Focus Lock

  CTLR ‘!’ ‘1’ SP ‘UA9’ SP ‘0’ CR

  DLA ‘@’ ‘1’ SP ‘0’ CR

- When requesting current Zoom/Focus Lock (if Zoom/Focus Lock is set to "Lock”)

  CTLR ‘?’ ‘1’ SP ‘UA9’ CR

  DLA ‘@’ ‘1’ SP ‘0’ SP ‘1’ CR

12.24 Power Save : ‘UAA’(55H 41H 41H)

Definition : Controls Power Save mode.
Command : ’UAA’(55H 41H 41H)
Parameter type : ON/OFF
Reply time : 3seconds
Conditions :
Notes : It cannot change for about 1 minute immediately after changing by power-on or this command. When it changes, an error occurs.

Operation mode

Standby Mode	Power ON mode	Cool-down mode	Emergency mode
X	O	X	X

Communication Examples

- When setting the Power Save mode to ON

  CTLR ‘!’ ‘1’ SP ‘UAA’ SP ‘1’ CR

  DLA ‘@’ ‘1’ SP ‘0’ CR
- When requesting current Power Save mode (if Power Save mode is OFF)

  CTLR ‘?’ ‘1’ SP ‘UAA’ CR

  DLA ‘@’ ‘1’ SP ‘0’ SP ‘0’ CR

12.25 Horizontal Pixel Adjust (Red) : ‘UB0’(55H 42H 30H)

Definition : Adjusts the Horizontal Pixel Adjust (red).

Command : ’UB0’(55H 42H 30H)

Parameter type : Special parameter (Refer to 7.3.12 Horizontal Pixel Adjust Parameter.)

Reply time : 3seconds

Conditions :

Operation mode

Standby Mode	Power ON mode	Cool-down mode	Emergency mode
X	O	X	X

Communication Examples

- When specifying "2" (decimal) as the Horizontal Pixel Adjust (red) level.

  CTLR ‘!’ ‘1’ SP ‘UB0’ SP ‘2’ CR

  DLA ‘@’ ‘1’ SP ‘0’ CR
- When requesting current Horizontal Pixel Adjust (red) level data (if Horizontal Pixel Adjust (red) level is set to "6" (decimal))

  CTLR ‘?’ ‘1’ SP ‘UB0’ CR

  DLA ‘@’ ‘1’ SP ‘0’ SP ‘6’ CR

12.26 Horizontal Pixel Adjust (Green) : ‘UB1’(55H 42H 31H)

Definition : Adjusts the Horizontal Pixel Adjust (green).

Command : ’UB1’(55H 42H 31H)

Parameter type : Special parameter (Refer to 7.3.12 Horizontal Pixel Adjust Parameter.)

Reply time : 3seconds

Conditions :

Operation mode

Standby Mode	Power ON mode	Cool-down mode	Emergency mode
X	O	X	X

Communication Examples

- When specifying "2" (decimal) as the Horizontal Pixel Adjust (green) level.

  CTLR ‘!’ ‘1’ SP ‘UB1’ SP ‘2’ CR

  DLA ‘@’ ‘1’ SP ‘0’ CR

- When requesting current Horizontal Pixel Adjust (green) level data (if Horizontal Pixel Adjust (green) level is set to "6" (decimal))

  CTLR ‘?’ ‘1’ SP ‘UB1’ CR

  DLA ‘@’ ‘1’ SP ‘0’ SP ‘6’ CR

12.27 Horizontal Pixel Adjust (Blue) : ‘UB2’(55H 42H 32H)

Definition : Adjusts the Horizontal Pixel Adjust (blue).

Command : ’UB2’(55H 42H 32H)

Parameter type : Special parameter (Refer to 7.3.12 Horizontal Pixel Adjust Parameter.)

Reply time : 3seconds

Conditions :

Operation mode

Standby Mode	Power ON mode	Cool-down mode	Emergency mode
X	O	X	X

Communication Examples

- When specifying "2" (decimal) as the Horizontal Pixel Adjust (blue) level.

  CTLR ‘!’ ‘1’ SP ‘UB2’ SP ‘2 CR

  DLA ‘@’ ‘1’ SP ‘0’ CR

- When requesting current Horizontal Pixel Adjust (blue) level data (if Horizontal Pixel Adjust (blue) level is set to "6" (decimal))

  CTLR ‘?’ ‘1’ SP ‘UB2’ CR

  DLA ‘@’ ‘1’ SP ‘0’ SP ‘6’ CR

12.28 Vertical Pixel Adjust (Red) : ‘UB3’(55H 42H 33H)

Definition : Adjusts the Vertical Pixel Adjust (red).

Command : ’UB3’(55H 42H 33H)

Parameter type : Special parameter (Refer to 7.3.13 Vertical Pixel Adjust Parameter.)

Reply time : 3seconds

Conditions :

Operation mode

Standby Mode	Power ON mode	Cool-down mode	Emergency mode
X	O	X	X

Communication Examples

- When specifying "2" (decimal) as the Vertical Pixel Adjust (red) level.

  CTLR ‘!’ ‘1’ SP ‘UB3’ SP ‘2’ CR

  DLA ‘@’ ‘1’ SP ‘0’ CR

- When requesting current Vertical Pixel Adjust (red) level data (if Vertical Pixel Adjust (red) level is set to "6" (decimal))

  CTLR ‘?’ ‘1’ SP ‘UB3’ CR

  DLA ‘@’ ‘1’ SP ‘0’ SP ‘6’ CR

12.29 Vertical Pixel Adjust (Green) : ‘UB4’(55H 42H 34H)

Definition : Adjusts the Vertical Pixel Adjust (green).

Command : ’UB4’(55H 42H 34H)

Parameter type : Special parameter (Refer to 7.3.13 Vertical Pixel Adjust Parameter.)

Reply time : 3seconds

Conditions :

Operation mode

Standby Mode	Power ON mode	Cool-down mode	Emergency mode
X	O	X	X

Communication Examples

- When specifying "2" (decimal) as the Vertical Pixel Adjust (green) level.

  CTLR ‘!’ ‘1’ SP ‘UB4’ SP ‘2’ CR

  DLA ‘@’ ‘1’ SP ‘0’ CR

- When requesting current Vertical Pixel Adjust (green) level data (if Vertical Pixel Adjust(green) level is set to "6" (decimal))

  CTLR ‘?’ ‘1’ SP ‘UB4’ CR

  DLA ‘@’ ‘1’ SP ‘0’ SP ‘6’ CR

12.30 Vertical Pixel Adjust (Blue) : ‘UB5’(55H 42H 35H)

Definition : Adjusts the Vertical Pixel Adjust (Blue).

Command : ’UB5’(55H 42H 35H)

Parameter type : Special parameter (Refer to 7.3.13 Vertical Pixel Adjust Parameter.)

Reply time : 3seconds

Conditions :

Operation mode

Standby Mode	Power ON mode	Cool-down mode	Emergency mode
X	O	X	X

Communication Examples

- When specifying "2" (decimal) as the Vertical Pixel Adjust (blue) level.

  CTLR ‘!’ ‘1’ SP ‘UB5’ SP ‘2’ CR

  DLA ‘@’ ‘1’ SP ‘0’ CR

- When requesting current Vertical Pixel Adjust (blue) level data (if Vertical Pixel Adjust (blue) level is set to "6" (decimal))

CTLR ‘?’ ‘1’ SP ‘UB5’ CR
DLA ‘@’ ‘1’ SP ‘0’ SP ‘6’ CR

12.31 Operation Mode Query : ‘Z03’(5AH 30H 33H)

Definition : Requests current operation mode
Command : ’Z03’(5AH 30H 33H)
Parameter type : Special parameter (Refer to 7.3.11 Projector Operation Mode Parameter.)
Reply time : 3seconds
Conditions : Query only

Operation mode

Standby Mode	Power ON mode	Cool-down mode	Emergency mode
O	O	O	O

When the POWER OFF command is received in the Power ON mode, the Projector first enters the Cool-Down mode, then automatically enters the Standby mode. (For information on each operation mode, refer to 10. Projector Operation Modes.)

POWER ON command cannot be accepted in the Cool-Down mode. If POWER ON is requested after POWER OFF command is sent, firstly the current operation mode should be asked and then if Standby Mode is confirmed, POWER ON command should be sent.

Communication Examples

- When requesting the current operation mode (if the Projector is in the standby mode)
  CTLR ‘?’ ‘1’ SP ‘Z03’ CR
  DLA ‘@’ ‘1’ SP ‘0’ SP ‘0000’ CR

12.32 Source Query : ‘Z05’(5AH 30H 35H)

Definition : Asks for the Source setting actually assigned on the Projector.
Command : ’Z05’(5AH 30H 35H)
Parameter type : (Refer to 11.1 Projector Sources and Source Numbers.)
Reply time : 3seconds
Conditions : Query only

Operation mode

Standby Mode	Power ON mode	Cool-down mode	Emergency mode
X	O	X	X

Communication Example

- When requesting the current Source setting actually assigned on the Projector (if 1080p60 is actually assigned)
  CTLR '?' '1' SP 'Z05' CR

DLA	'@'	'1'	SP	'0'	SP	'10'	CR

13.0 APPENDIX

13.1 External Control Command List

Command	Character	HEX
Hide	‘U00’	55H 30H 30H
Black Color	‘U01’	55H 30H 31H
Color Temperature Table	‘U0B’	55H 30H 42H
Color Temperature (Red)	‘U0C’	55H 30H 43H
Color Temperature (Green)	‘U0D’	55H 30H 44H
Color Temperature (Blue)	‘U0E’	55H 30H 45H
Power	‘U0F’	55H 30H 46H
Menu Auto Off	‘U10’	55H 31H 30H
Sleep Time	‘U12’	55H 31H 32H
Zoom W	‘U13’	55H 31H 33H
Zoom T	‘U14’	55H 31H 34H
Focus +	‘U15’	55H 31H 35H
Focus -	‘U16’	55H 31H 36H
Right/Left Reverse	‘U17’	55H 31H 37H
Top/Bottom Invert	‘U18’	55H 31H 38H
Transfer Rate	‘U1B’	55H 31H 42H
Lamp Time	‘U1C’	55H 31H 43H
ID	‘U1D’	55H 31H 44H
Gamma Table	‘U73’	55H 37H 33H
Mask	‘UA0’	55H 41H 30H
Test Pattern	‘UA1’	55H 41H 31H
Picture Shift	‘UA2’	55H 41H 32H
Zoom/Focus Lock	‘UA9’	55H 41H 39H
Power Save	‘UAA’	55H 41H 41H
Horizontal Pixel Adjust (red)	‘UB0’	55H 42H 30H
Horizontal Pixel Adjust (Green)	‘UB1’	55H 42H 31H
Horizontal Pixel Adjust (Blue)	‘UB2’	55H 42H 32H
Vertical Pixel Adjust (Red)	‘UB3’	55H 42H 33H

Vertical Pixel Adjust (Green)	‘UB4’	55H 42H 34H
Vertical Pixel Adjust (Blue)	‘UB5’	55H 42H 35H
Operation Mode Query	‘Z03’	5AH 30H 33H
Source Query	‘Z05’	5AH 30H 35H

13.2 RS-232C Port Pin Configuration

RS-232C Control Port		
Pin. No.	Signal	Definition
1	N/A	Not Used
2	RxD (RD)	Receive Data
3	TxD (SD)	Transmit Data
4	N/A	Not Used
5	GND	GND
6	N/A	Not Used
7	N/A	Not Used
8	N/A	Not Used
9	N/A	Not Used

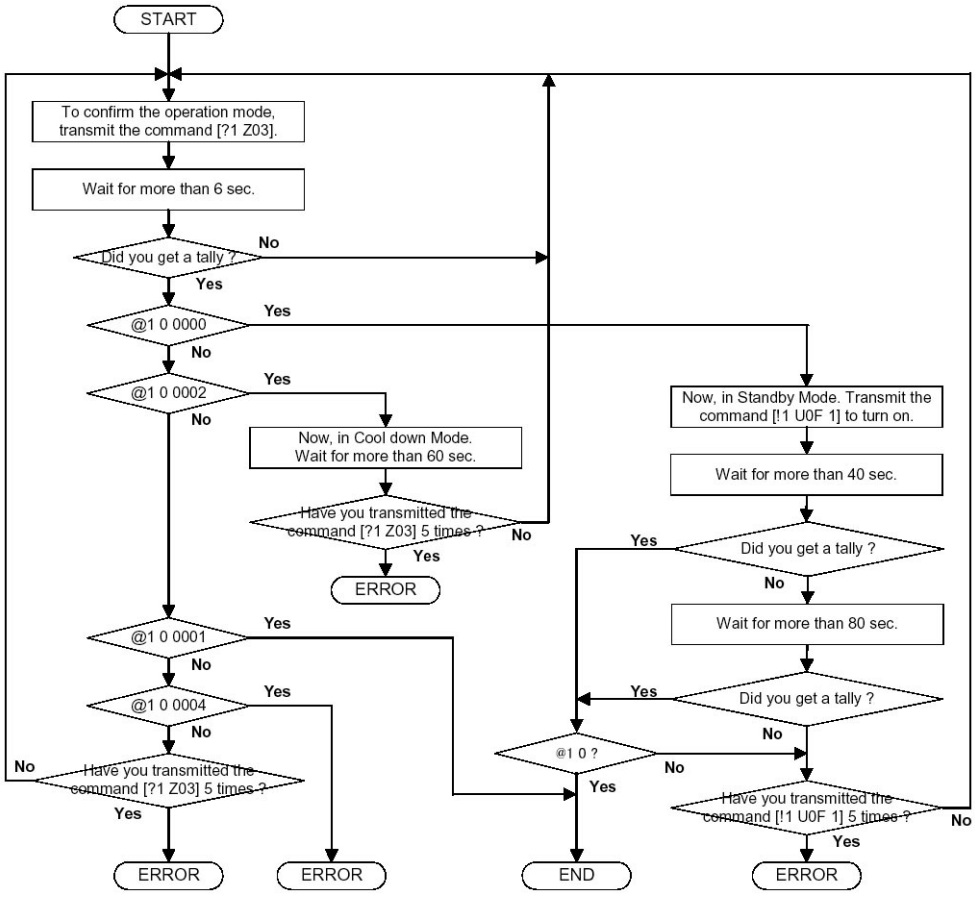
13.3 ASCII to Hex Conversion Table

ASCII	Hex
‘0’	30H
‘1’	31H
‘2’	32H
‘3’	33H
‘4’	34H
‘5’	35H
‘6’	36H
‘7’	37H
‘8’	38H
‘9’	39H
‘A’	41H
‘B’	42H
‘C’	43H
‘D’	44H
‘E’	45H
‘F’	46H
‘CR’	0DH
‘SP’	20H
‘!’	21H
‘&’	26H
‘?’	3FH
‘@’.	40H

13.4 Flow chart of “Power ON Control”

We mention an example of flow chart as below. The commands printed in the chart are in the case of “ID = 1”. For details about an ID, refer to “12.18 ID”.

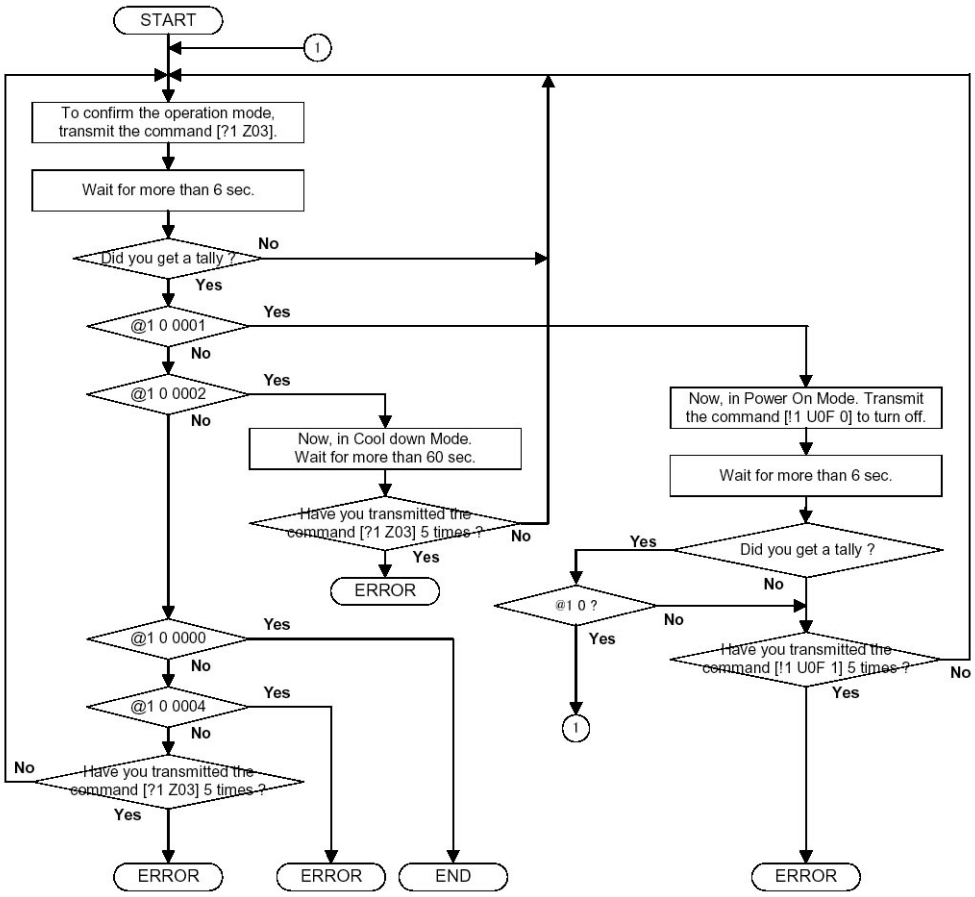
Example:



13.5 Flow chart of “Power OFF Control”

We mention an example of flow chart as below which diagrams through “Cool-down mode” up to “Standby mode”. The commands printed in the chart are in the case of “ID = 1”. For details about an ID, refer to “12.18 ID”.

Example:.


START
1
To confirm the operation mode, transmit the command [?1 Z03].
Wait for more than 6 sec.
Did you get a tally ?
No
Yes
@1 0 0001
Yes
No
@1 0 0002
Yes
No
Now, in Cool down Mode. Wait for more than 60 sec.
Have you transmitted the command [?1 Z03] 5 times ?
No
Yes
ERROR
@1 0 0000
Yes
No
@1 0 0004
Yes
No
No
Have you transmitted the command [?1 Z03] 5 times ?
Yes
ERROR
ERROR
END
Now, in Power On Mode. Transmit the command [!1 U0F 0] to turn off.
Wait for more than 6 sec.
Did you get a tally ?
Yes
No
@1 0 ?
No
Yes
1
Have you transmitted the command [!1 U0F 1] 5 times ?
No
Yes
ERROR